

1. (Amended) A method for producing pulp from lignocellulose fiber-containing feed material comprising the steps of:

first conditioning said fiber containing feed material at an elevated temperature and pressure in an environment of saturated steam at a pressure of at least about 10 psi to produce a conditioned feed material;

[subsequently] directly thereafter compressing said conditioned feed material in an environment of saturated steam at a pressure of at least about 10 psi to [cause separation of] destructure said fibers without significant breakage across grain boundaries; and

[finally refining] further processing said destructured feed material to form a lignocellulose pulp.

2. (Amended) The method as claimed in claim 1, wherein said conditioning of said feed material is performed at [a temperature in the range of 90-150°C,] a pressure in the range of 10-100 psi[,] and said compression is performed in a compression screw device in the range of from 4:1 to 8:1 of the non-compressed volume of said conditioned feed material[, wherein compressing said material is accomplished in a screw compression device].

3. (Amended) The method of claim [2] 1, wherein said destructured lignocellulose fiber- containing material is refined into pulp by a thermo-mechanical process including the further steps of,

preheating the destructured material in an environment of saturated steam at a pressure higher than the pressure of the environment at which the material was destructured; and

a² ~~2~~
conveying the preheated material to the inlet of a primary disc refiner operating at a pressure higher than the pressure of the environment at which the material was destructured.

5. (Amended) The method of claim [2] 1, wherein said destructured lignocellulose fiber-containing material is refined into pulp by a low-resident time, high temperature, high speed process including the further steps of,

preheating the destructured material in an environment of saturated steam at a pressure above the glass transition temperature of the lignin in the material, for a period of time less than 30 seconds;

a³ ~~3~~
conveying the preheated material to the inlet of a primary disc refiner operating at a temperature above the glass transition temperature of the lignin; and

refining the material at a disc speed of rotation that is greater than 1500 rpm for a double disc refiner or greater than 1800 rpm for a single disc refiner.

B ~~23~~ 23. The method of claim ~~3~~³¹, wherein the step of preheating is preceded by the steps of

a⁴ ~~4~~
discharging the destructured material into a conveyor at substantially atmospheric pressure;

conveying the discharged material into a storage bin at substantially atmospheric pressure; and

conveying material from the bin by a plug screw feeder through a pressure barrier into the higher pressure environment where said step of preheating is performed.

B 10H4 24. The method of claim ³⁴5, wherein the step of preheating is preceded by the steps of
discharging the destructured material into a conveyor at substantially atmospheric pressure;
conveying the discharged material into a storage bin at substantially atmospheric pressure; and
conveying material from the bin by a plug screw feeder through a pressure barrier into the higher pressure environment where said step of preheating is performed.

a 10B2 25. The method of claim 1, wherein the steps of conditioning and compressing are both performed in substantially the same saturated steam environment.

26. The method of claim 3, wherein said saturated steam environment for conditioning and compression is at a saturation pressure corresponding to a temperature no greater than about 120 deg C and the steps of preheating and conveying the destructured material are performed at a saturation pressure corresponding to a temperature greater than about 120 deg C.

27. The method of claim 26, wherein the conditioning of said feed material is performed for a period of time in the range of 3-60 seconds.

28. A method for producing pulp from lignocellulose fiber-containing feed material comprising the steps of:

first conditioning said fiber containing feed material in an environment of steam at a pressure in the range of about 30 - 100 psi to produce a conditioned feed material;

30-100 psi directly thereafter compressing said conditioned feed material at a compression ratio of at least about 4:1 in an environment of steam at a pressure in the range of about 30 - 100 psi to destructure said fibers without significant breakage across grain boundaries; and

further processing said destructured feed material to form a lignocellulose pulp.

15-25 psi 29. A method for producing thermo-mechanical pulp from lignocellulose fiber-containing feed material comprising the steps of:

first conditioning said fiber containing feed material in an environment of saturated steam at a pressure in the range of about 15-25 psi to produce a conditioned feed material;

subsequently compressing said conditioned feed material in a screw press in an environment of saturated steam at a pressure in the range of about 15-25 psi at a compression ratio of at least about 4:1 to destructure said fibers; and

finally refining said material to form a lignocellulose pulp.

30. A method for producing chemical pulp from lignocellulose fiber-containing feed material comprising the steps of:

first conditioning said fiber containing feed material in an environment of saturated steam at a temperature of at least about 120 deg. C and a corresponding saturation pressure to produce a conditioned feed material;